

Remarks/Arguments

Claims 1,2,5-12 and 14-26 remain in this application. Claims 3, 4, and 13 have been canceled.

In reference to the office action ad seriatim, claims 1-26 were rejected under the second paragraph of 35 USC 112 as being indefinite since the independent claims, i.e., 1 and 12, require a choice of light. As is explained below, the laser wavelength of the light source does matter. As noted at bottom of p. 8 of the specification,

“Resonant excitation means that a portion of the linewidth of the illuminating light source overlaps with the infrared absorption based on the target material.”

It is believed that this issue is clarified further below.

With respect to improper Markush group in claims 2 and 13, claim 2 has been amended to remove the term “polymeric, organic” and claim 13 has been canceled.

In reference to claim 3, since the claim has been canceled, issues pertaining thereto are moot.

In reference to claims 5 and 15, it is believed that thickness is properly denoted since thickness will be different depending on what target material is used. The inventors herein are amenable to any reasonable suggestion that the Examiner has. Reference to claims 23 and 25 is not understood.

It is believed that the objection to claims 10 and 20 has been overcome by revising the structure of the claims.

Claim 21 has been amended by removing the term “planar” therefrom and providing a period at the end, thus satisfying the objection.

Since claim 13 has been canceled, issues pertaining thereto are moot.

Claim 25 has been amended by changing "macroseconds" to "microseconds" and by correcting spelling of "to."

The subject matter of claims 1-26 was commonly owned at the time the invention was made.

Claims 1-26 were rejected under 35 USC 103 (a) as being obvious over the Donley in view of the Blanchet-Fincher references, or vice versa. The Examiner contends that the spectral results give in either case for material being treated would have suggested absorption techniques available to determine useful wavelengths.

Contrary to the Examiner's conclusion, it is believed that the claimed subject matter herein is unobvious over the combination of the Donley in view of the Blanchet-Fincher references, or vice versa.

Organic hydrocarbon materials share many common structural features. Most are made of carbon atoms bonded to each other. Bonded to the carbon atoms are hydrogen atoms. Therefore, common chemical bonds in any organic material are C-H and C-C. Vibrational excitation of the atoms in the C-H and C-C bonds occurs over a narrow range of infrared wavelengths. C-H bonds are resonantly excited to vibrate at 2.9 μm and C-C bonds are resonantly excited to vibrate at various wavelengths depending on type of bond. The technical literature lists the following ranges, excluding overtones: C-H stretch at 3.3-3.5 μm , C-H bend at 6.8-7.3 μm , C-C stretch at 8.3-12.5 μm , C=C stretch at 5.7-6.4 μm and C≡C at 4.4-4.8 μm . Only a very narrow range of frequencies near the main absorption frequency are absorbed by the target material. For infrared wavelengths that are different from these two wavelengths, in a material that contains only C and

H atoms, the light is not absorbed by the material and is transmitted unattenuated through the material. The light cannot be used to convert the solid to a vapor unless it is absorbed by the material. Non-resonant light is unable to non-destructively convert the solid to a vapor.

The technique can be generalized beyond simple hydrocarbons, including biological materials. The technique is not limited to hydrocarbons since all materials contain atoms that vibrate and can absorb infrared light at a wavelength that corresponds to one that resonantly excites the vibrational motion.

In this application, the light impinging on the target is in the infrared range. Light of any wavelength cannot be used. The wavelength of light to be used is determined by identifying what wavelengths of light are absorbed by the material in the infrared region. This is accomplished by measuring the infrared absorption spectrum. Then the laser wavelength is chosen to match the region in which the material can absorb the light. The mechanism by which light in the infrared region is absorbed involves the resonant excitation of vibrational modes in the absorbing material. The key to the success of this technique is the conversion of the laser light to mechanical vibrational energy in the solid material. Once the material has enough vibrational energy, it can be converted from the solid to the gas phase. There is no change in the molecular structure of the target material in this process. The bonding relationship between the atoms in the molecule remains the same as the material is transformed from the solid phase to the gas phase.

There is a great deal of difference between what is claimed here and what is disclosed by the Donley and the Blanct-Fincher references. The Donley reference relates to laser ablation. In laser ablation, the laser is used to convert the target material into a vapor that contains atoms and ions. The chemical structure of the target material is destroyed. The atoms arrive at the substrate

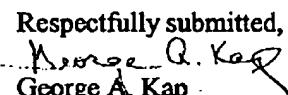
surface and self-assemble on the substrate. In the case of organic materials, there are an infinite number of structures that can be formed from a vapor that contains C atoms and H atoms. Both the Donley and the Blanchet-Fincher references teach a method that destroys the target material by converting it to a vapor material that contains only atoms and then reassembling the structure of the material on the surface of the substrate. It only works for a limited set of materials. The high intensity of the laser causes dielectric breakdown of the target material producing a vapor that contains atoms, ions and electrons. The laser wavelength does not matter for conventional PLD. Once breakdown takes place, the laser energy continues to be absorbed by the plasma further heating the target material to evaporate more material, and further heating the vapor to create atoms and ions out of the solid.

What is disclosed herein is a unique technique that takes advantage of the unique molecular structure of the target material. By carefully determining the correct laser wavelength with which to illuminate the target sample, the target material can be converted from a solid to a gas with no change in the chemical structure. The vapor phase material can then be re-deposited on any surface. The technique is general to all materials. The technique can be used to deposit thin films of organic and biological materials. If the technique of the Donley and the Blanchet-Fincher references were used, for example, on a sample of DNA, the technique would take a material that contains no C, H, O, N in a very complex arrangement, convert it to an atomic vapor and then try to re-assemble that same chemical structure on a nearby surface. It is thermodynamically impossible to do. In the technique disclosed herein, a laser is used to transform the DNA solid to a DNA vapor where the vapor has the same arrangement of the atoms that the solid had, and then collect that vapor on a nearby surface. It cannot be done using

the referenced technique. It requires a prior examination of the infrared absorption spectrum of the material and selection of an infrared wavelength to excite the material and transform it from solid to vapor.

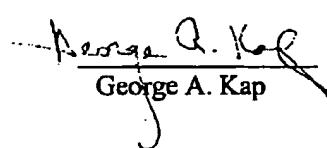
Reconsideration and allowance of claims 1, 2, 5-12 and 14-26 is requested. The only independent claims 1 and 12 in the claims under prosecution contain a limitation that the light impinging on the target material is of a wavelength in the infrared region that is resonant with a vibrational mode in the target material. This limitation makes it possible to transfer the target material onto a substrate without its modification. The applied references do not suggest nor disclose such a limitation and accidental disclosures are not a proper basis for an obviousness rejection.

It is hereby petitioned to extend the time for reply one month to April 1, 2004. Please charge our account #50-0281 the one-month extension fee of \$110.00, or whatever is appropriate.

Respectfully submitted,

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I hereby certify that this amendment is being faxed to PTO on the date shown below:

3/30/04
Date


George A. Kap